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(54) IMPROVEMENTS RELATING TO THE FORMATION OF
 CREASES IN BOARD IN OR FOR THE MANUFACTURE OF
 CARTON BLANKS

(71) We, ALF COOKE LIMITED, a British Company of Crown Point, Leeds LS10 1AR, Yorkshire, and GEORGE HADDOCK, a British subject of 26 Park Road, Bramley, Leeds 13, Yorkshire, do hereby declare the invention for which we pray that a patent may be granted to us and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to the formation of hinges defined by crease lines in board, in or for the manufacture of carton blanks and in particular concerns a method of and apparatus for, the formation of hinges defined by crease lines in such carton blanks or in paper board from which such a blank or blanks is or are to be produced.

The board or carton blanks may be printed or otherwise decorated either before or after the creasing operation, or may be unprinted.

Carton blanks may be cut out of a sheet of board and the cutting operation normally takes place simultaneously with the formation of the creaser lines in the blank, but in the broadest aspect of the invention the cutting operation may take place before, during or after the creasing operation.

In a known method of creasing and simultaneous cutting of carton blanks, a cutting and creasing forme is constructed. This forme is a plate like structure from a face of which upstands or upstand a knife or knives having an edge or edges defining the peripheral shape of the blank or blanks and a creasing rule at each of the locations where crease lines are to be formed in the blank.

This forme is used to produce a female counterpart or "make ready" between which and the forme the board is pinched in order to cut therefrom, and crease, the blank. The make ready is constructed by laying a first layer of paper on a platen, (this may be flat for a flat bed cutting and creasing machine

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or cylindrical or part cylindrical for a rotary cutting and creasing machine) laying a second layer of paper over the first and next laying a layer of hard manilla board over the second layer of paper. The manilla board is covered by a sheet of carbon paper and the forme and pack of layers on the platen are brought into contact so that ink lines are produced on the manilla board where creases are to be formed, this being as a result of the creasing rule edges pressing against the pack of layers. The manilla board is now cut away, whilst on the platen, along the peripheral regions of each carton to be cut, and along each line where a crease line is to be formed a slot or channel is cut in the manilla board. The cutting of these slots or channels requires a high degree of skill because if the slots or channels are not cut accurately then this can lead to trouble at a later stage in the handling of blanks for example when they are erected especially where the blanks have to be erected by automatic machinery. Indeed, the accurate formation of these grooves has been a major problem in the field of forming crease lines in board. Moreover, a new make ready has to be constructed for every new carton blank to be produced. This is naturally time consuming particularly in view of care which must be exercised in forming the said slots.

Many proposals have been put forward for assisting and rendering simpler the cutting of the said slots or channels and some have resulted in commercially available specialised cutting tools to enable the person cutting the slots to control accurately the cutting of the slots, but the setting up of these tools is time consuming and operation thereof is difficult. Because of this, these tools have not been widely accepted in the carton industry.

An object of the present invention, or at least the preferred form thereof, is to provide a method of forming hinges defined by

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crease lines in board whereby the said disadvantages are eliminated.

According to the present invention there is provided a method of forming in carton board and in a predetermined pattern a plurality of hinges each defined by crease lines by pressing the board between a creasing forme having a plurality of pairs of spaced parallel creasing rules of which the creasing edges are rounded and which are arranged in said predetermined pattern and a smooth platen surface so that each pair of creasing rules forms in the board two crease lines defining a hinge.

The spacing between the creasing rules will require to be varied depending upon the board being creased. In general, experiment has shown that the thicker the board, the greater the spacing between the rules.

By supporting the board on a smooth surface, e.g. a flat or arcuate platen, considerable time and expenditure as compared with the convention method are saved, as no make ready is required.

Tests have shown that the crease lines in the board need to be at least of noticeable depth to enable the board to be folded satisfactorily and when the rules are set relative to the platen there is little danger of the creasing rules fracturing the board because of the size of said rounded edges.

In a practical application, it will be more usual to produce a number of hinges in the board during the creasing (and perhaps cutting) and to this end, the forme will have two parallel creasing rules for each hinge. Where the cutting is carried out simultaneously with the creasing, conventional cutting arrangements may be used.

Also according to the present invention there is provided a creasing forme for a carton board creasing machine including a plurality of pairs of spaced, parallel creasing rules of which the creasing edges are rounded and which are arranged in a predetermined pattern so as to produce in board creased by the forme and in said predetermined pattern, a plurality of hinges each defined by two spaced crease lines, said pairs of parallel rules being removably located in a forme plate structure. The forme may also have a cutting knife defining the peripheral shape of the carton to be cut and creased by the forme. The forme may be for the creasing and cutting from a sheet of a plurality of carton blanks.

The forme may be built up in the normal conventional manner i.e. by inserting the knife edge and creasing rule pairs (with spacing means therebetween) in slots or channels in a single forme plate or by locating the rules and knife edge between multi-forme plate pieces and the forme is held in clamps to prevent it from collapsing. In

either case, each twin creasing rule may alternatively be pre-fabricated from bars to predicted and specified sizes so that the rules of each pair will be integral instead of being separate and spaced by spacer pieces. In such latter case, each creasing rule pair may have the cross sectional shape of a tuning fork, the top edges of twin arms serving to form the crease lines and the lower single leg being for location in an appropriate slot in the forme plate structure.

The invention further provides a machine for creasing carton board including a creasing forme having a pair of spaced parallel creasing rules which are for producing each hinge to be formed, and of which the creasing edges are rounded and a platen having a smooth surface which in use presses the board against the forme so that the edges of the pairs of creasing rules produce spaced parallel crease lines in the board to define the hinges.

The invention also provides a carton blank which has been creased by the method as aforesaid.

In the method of the invention, the crease lines will normally be formed in the rear side of the board. This is opposite to conventional creasing using a make ready and a single creasing rule for each hinge, where in the creasing is effected on the face side of the board.

Embodiments of the invention will now be described, by way of example, with reference to the accompanying drawings, wherein:—

Figure 1 is a sectional elevation, to an enlarged scale, of a creasing rule in the process of creasing carton blank board according to a conventional method.

Figure 2 is a sectional elevation, also to an enlarged scale, of a pair of creasing rules in the process of creasing carton blank board according to an embodiment of the invention;

Figure 3 shows the platen and cutting and creasing forme of a cutting and creasing machine according to the invention; and is a sectional elevation; and

Figure 4 is similar to fig. 2, but shows another form of creasing rule.

In Figures 1, 2 and 4 the platen is shown at 10, and the board at 12 (with outer and inner faces at 12A and 12B).

In Figure 1, a make ready on the platen is shown at 14, a make ready slot or channel at 16, the forme at 17 and the creasing rule at 20. Comparing this Figure 1 with Figure 2, it will be seen in fig. 2 that the board 12 is creased by two parallel creasing rules 20A of which the creasing edges are rounded and which are spaced apart by a spacer 22 whose thickness is accurately known and no make ready is used.

In the alternative arrangement of Fig. 4

the twin rules 20B, 20B again more rounded creasing edges, but the rules in this case are defined by the arms of a fabricated tuning fork sectional bar of which the leg 20D is located in a slot in forme 17. The spacing of the rules 20B is determined accurately during manufacture of the bar.

In each of the cases known in figs 2 and 4, the rule spacing is such that the two creaser lines produced are special to define a single hinge in the board.

of Figs. 1 and 2 and 4, the folding is in the direction of the arrows 24 and it will be seen therefore that the creasing rules are defined by the arms of a fabricated turning applied on opposite sides of the board as regards Figure 1 and figures 2 and 4.

The machining of groove 16 accurately is very difficult but the accurate spacing of the rules 20A (by means of the accurately machined spacer 22 or machining of bar creasing rules 20B is relatively simple in comparison and moreover, the twin rule arrangement provides a more accurately located hinge. Carton blanks having hinges made according to the invention are, because of the arcuate location and formation of the hinges, more suitable for erection by automatic erecting machinery. As such machinery operates at high speed, this advantage is considerable.

Referring now to Fig. 3, the complete forme, represented by reference numeral 18 in Fig. 3, is shown in perspective view. Also shown in this fig. is the machine platen 30 which co-operates with the forme 18 in a cutting and creasing process. The platen 30 is shown as being arcuate and having a horizontal axis of rotation 32. In use, the platen rotates continuously whilst the forme 18 reciprocates forwards and backwards as indicated by arrow 33. A sheet of board 31 is placed, face upwards on the forme 18 when it is in the position shown, the forme 18 then moves forward and the platen 30 rolls over the board upper face pressing the board to the platen whereby the board is cut into carton blanks, hinges simultaneously being formed in such blanks. When the platen reaches the end of the forward stroke, the platen has left contact with the board. The forme 18 returns to the position shown in fig. 3 whilst the platen 30 continues its rotation.

Each cycle is preferably initiated by an operator who places each sheet of board on the forme 18 when it is in the position shown and he removes the cut blanks from the forme 18 when it returns to the initial position, before reloading the machine. If the machine is adapted for automatic operation the cut and creased blanks may be removed from the forme 18 automatically when in the forward position, and the forme

18 would be automatically loaded when in the rear position, and rotation of the platen 30 could be continuous.

In a flat platen machine, the platen is simply reciprocated up and down in synchronism with the movements of the forme, but in this case the forme 18 takes up a position underneath the platen in its forward position.

Considering now forme 18 in detail, this comprises a rectangular knife edge 34 defined by knives 34A, 34B, 34C and 34D. The area defined by the knife edge 34 is sub-divided into nine equal rectangular areas by further knives 36, 38 so that during each cycle of the machine, nine carton blanks are produced.

Each of the said nine equal rectangular areas is further sub-divided into sections by twin edge creasing rule assemblies 40 each constructed of two creasing rules 20A as shown in enlarged detail in Fig. 2 or Figure 4, so that on each blank produced there is also formed a criss-cross pattern of fold creases and each crease is defined by a pair of parallel crease lines as explained in detail in relation to Figs. 1 and 4. The top edges of the creasing rule assemblies 40 are located below the knife edge by the desired amount for the board being cut and creased to ensure that the creases of the correct depth are formed in the board.

The creasing rule assemblies 40 are shown in one only of the nine rectangular areas in the interests of clarity, but it will be appreciated that this arrangement is duplicated in each of said areas. Moreover, it is to be appreciated that the arrangement of creasing assemblies 40 and cutting knives is varied depending upon the shape of carton to be produced. The simple arrangement shown is merely for the purposes of explanation.

The knives and creasing assemblies 40 are held in position by means of multi-forme plate pieces 42 and the whole assembly comprising plate pieces 42, knives and creasing assemblies 40 is held rigid by means of adjustable screw clamps 44 which in turn are mounted on a rigid form base plate 46 to which the reciprocation drive mechanism is attached.

Small blocks 48 of resilient material such as sponge rubber located adjacent the knives and creasing rules 40 serve to ensure that the carton blanks are pushed off the knives and creasing rules after each cutting and creasing operation. Only a few of these blocks 48 are shown in the drawing; as many as are required to achieve the above effect would be used in practice. The blocks 48 may be glued to the forme pieces 42 so that the blocks 48 remain in position during operation of the machine but can be removed fairly readily when dis-assembling

the forme 18.

In the subsequent folding of the blank creased according to the invention, the stretching of the board fibres at the opposite side of the hinge is minimal and therefore the surface of such side may be varnished or lacquered, a requirement of many blank face surfaces.

The spacing between the creasing rules of each pair should be such that the two parallel crease lines formed thereby in the board define a hinge.

board define a single hinge.

15 WHAT WE CLAIM IS:—

1. A method of forming in carton board and in a predetermined pattern a plurality of hinges each defined by crease lines by pressing the board between a creasing forme having a plurality of pairs of spaced parallel creasing rules of which the creasing edges are rounded and which are arranged in said predetermined pattern and a smooth platen surface so that each pair of creasing rules forms in the board two crease lines defining a hinge.

2. The method according to Claim 1 wherein the smooth platen surface is arcuate and the forme is a flat structure over which the arcuate surface rolls in forming the crease lines.

3. The method according to Claim 1, wherein the smooth platen surface is flat and the forme is a flat structure and the forme and flat platen surface are pressed together in forming said crease lines.

4. The method according to any preceding claim, wherein said forme also has knife edges so that the carton board is simultaneously cut into blanks as the crease lines are formed therein.

5. A method of creasing carton board substantially as hereinbefore described with reference to Figs. 2 and 3 or figs 3 and 4 of the accompanying drawings.

6. A creasing forme for a carton board creasing machine including a plurality of pairs of spaced, parallel creasing rules of which the creasing edges are rounded and which are arranged in a predetermined pattern so as to produce in board creased by the forme and in said predetermined pattern, a plurality of hinges each defined by two spaced crease lines, said pairs of parallel rules being removably located in a forme plate structure.

7. A forme according to Claim 6, wherein the creasing rules of each said pair are held spaced apart by a spacer whose thickness is accurately known.

8. A forme according to Claim 7, wherein the creasing rules of each pair are integral in that they are formed in a bar of tuning

fork section.

9. A forme according to Claim 6, 7 or 8, wherein said plate structure is defined by a plurality of multi-forme plate pieces, the pieces and pairs of parallel creasing rules being held as a rigid structure by means of clamps.

10. A forme according to any of Claims 6 to 9, including cutting knives which are for cutting the carton board into blanks simultaneously with the creasing of the board.

11. A creasing forme substantially as hereinbefore described with reference to Fig. 3 of the accompanying drawings.

12. A machine for creasing carton board including a creasing forme having a pair of spaced parallel creasing rules which are for producing each hinge to be formed and of which the creasing edges are rounded and a platen having a smooth surface which in use presses the board against the forme so that the edges of the pairs of creasing rules produce spaced parallel crease lines in the board to define the hinges.

13. A machine according to Claim 12, wherein the creasing rules of each of said pair are held spaced apart by a spacer rule whose thickness is accurately known.

14. A machine according to claim 12, wherein the creasing rules of each pair are integral in that they are formed in a bar of tuning fork section.

15. A machine according to Claim 12, 13 or 14, wherein the forme is a plate structure having slots therein and in which the pairs of spaced parallel rules are located.

16. A machine according to Claim 15, wherein the plate structure is defined by a plurality of multi-forme plate pieces, the pieces and pairs of parallel creasing rules being held as a rigid structure by means of clamps.

17. A machine according to any of claims 12 to 16, wherein the forme has cutting knives for cutting the carton board into blanks simultaneously with the creasing thereof by said pairs of rules.

18. A machine for cutting and creasing carton board, substantially as hereinbefore described with reference to Fig. 3 of the accompanying drawings.

19. A carton blank produced by the method according to claim 4.

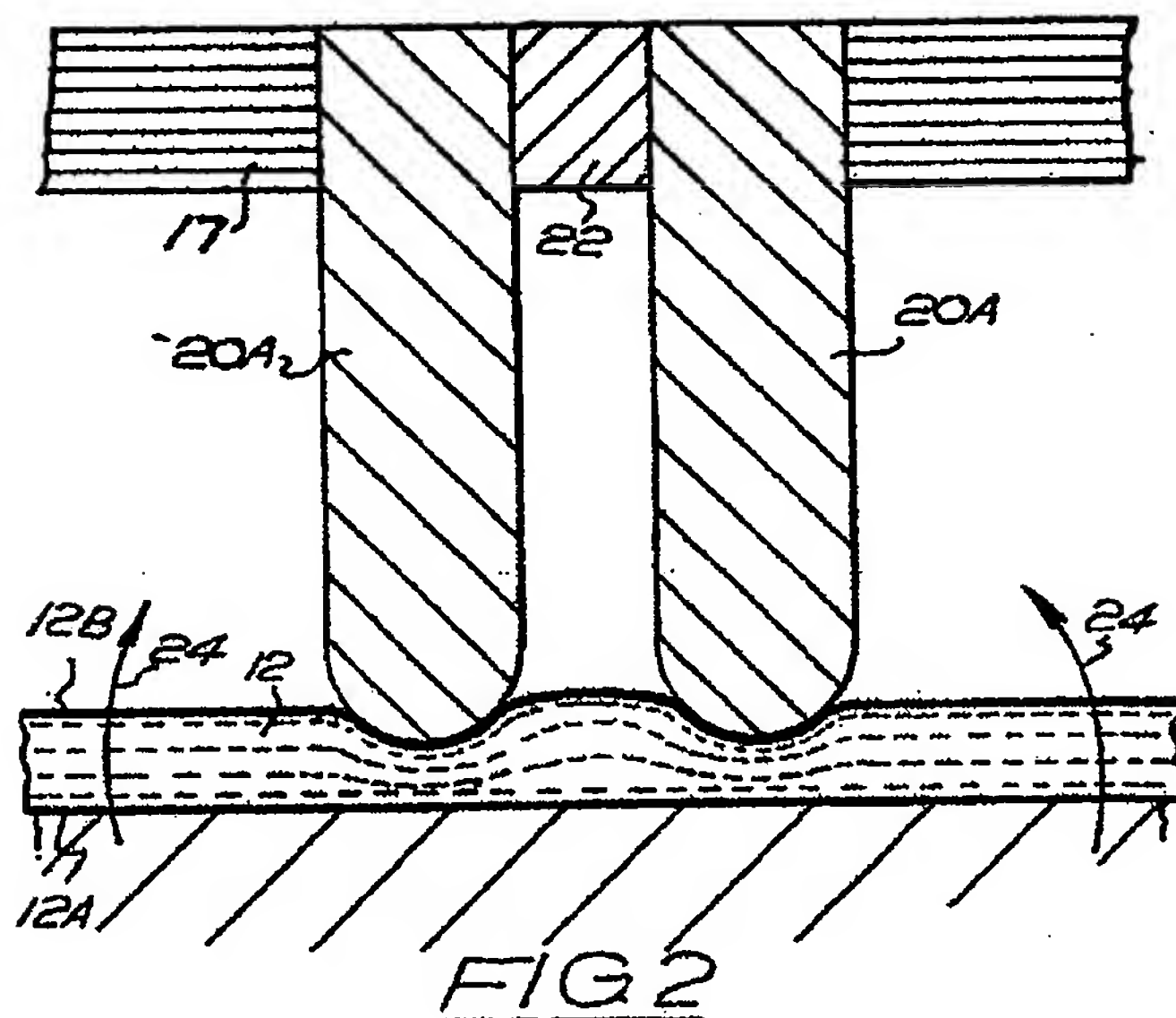
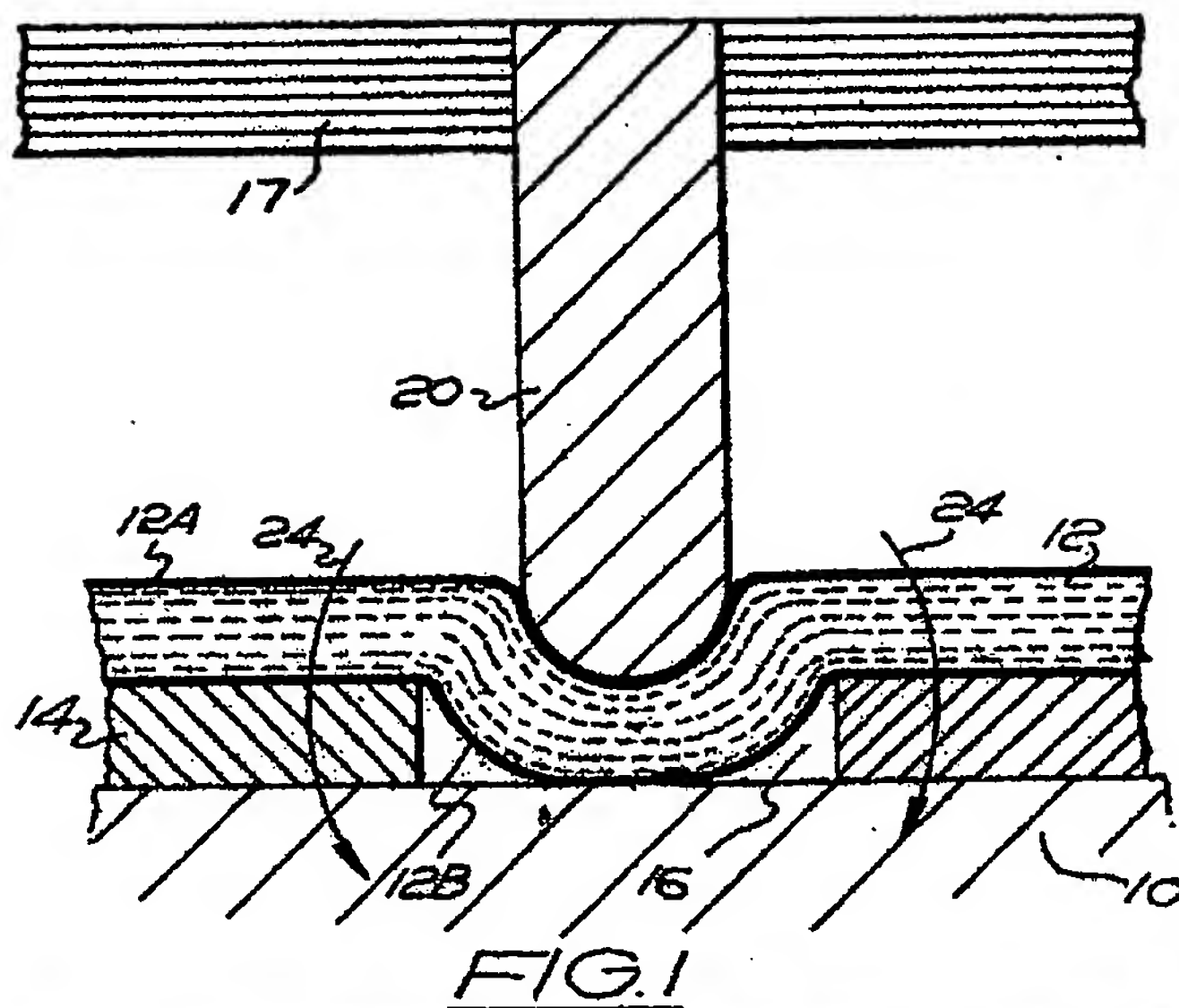
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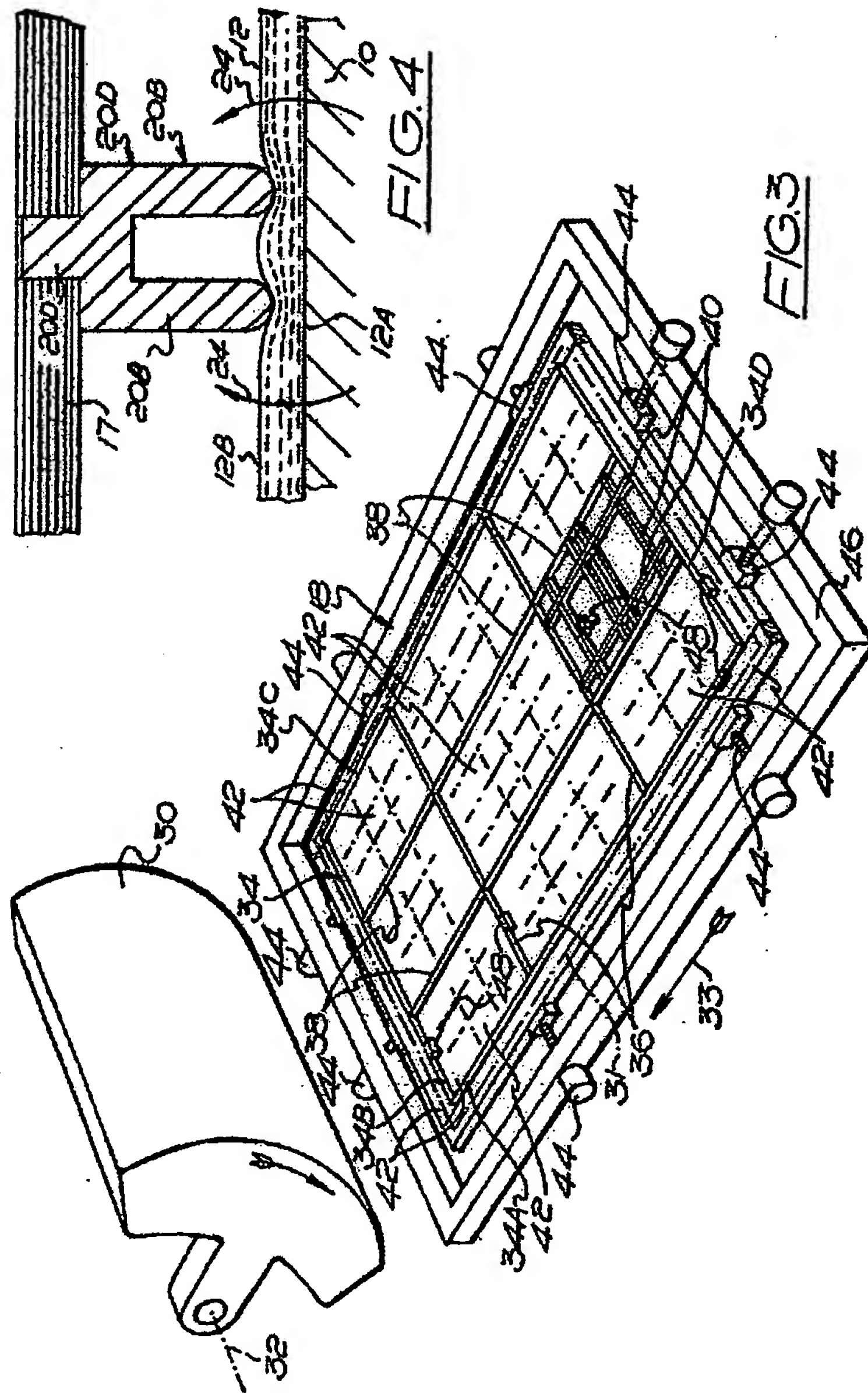
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